

SEQUENCE LISTING

<110> E. I. du Pont de Nemours and Company

<120> Genes Encoding Sulfate Assimilation Proteins

<130> BE-1167-B

<140>

<141>

<150> 60/092,833

<151> July 14, 1998

<160> 14

<170> Microsoft Office 97

<210> 1

<211> 890

<212> DNA

<213> Zea mays

<400> 1

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agggctctgct gaaccagaag ggctgcgtcg tctggatcac tggcctaagc gggttcaggga 180
aaagcacgct cgcgtgcgcg ctgagccgcg agctgcacgg cagaggccac ctcacgtacg 240
tcctcgacgg cgacaacctc aggcacgggc tgaacaggga cctcagcttc ggagcagagg 300
accgcgccga gaacatccgc agagtggggg aagtacgcaa gctgttcgcc gacgctggcc 360
tcgtctgcat cgccagcctc atatcgccct acagaagcga ccgaagcgcg tgcgcgac 420
tgctgcccaa gcaactcggtt atcgaggtgt tcctggacgt gccgcttcaa gtgtgcgaag 480
ccagggaccc caaaggcctc tacaagctcg cacgcgcggg caaaatcaaa gggttcaccg 540
gcacgcagca tccttacgaa ccgccgtcgg actgtgagat agtgatccag tgtaaagtcg 600
gcgactgcc ctcgcctgaa tcgatggctg gtcacgttgt gtcgtacctt gagacgaatg 660
gtttcctcca ggactagaca tggaatgcga tcgatgcgtc tgatgtgtat atatgtagca 720
gcagccggag cggcattgcc aaggctgtgt aatctcatgg ctgtctttct ctttaagacc 780
aaaacaaaca agagatggca gtgtaaaaag gaaaaaaaaa actgcgtctg acagagtcgc 840
tgaatcaacc atgcttctga taaaaaaaaa aaaaaaaaaa aaaaaaaaaa 890

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<210> 2

<211> 224

<212> PRT

<213> Zea mays

<400> 2

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Ser Ala Ala Ala Val Ala Gly Ile Ser Ser Ser Ser Ala Leu
  1             5             10             15

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Val Thr Ser Thr Val Gly Lys Ser Thr Asn Ile Leu Trp His Glu Cys
      20             25             30

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Ala Ile Gly Gln Lys Glu Arg Gln Gly Leu Leu Asn Gln Lys Gly Cys
      35             40             45

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```

Val Val Trp Ile Thr Gly Leu Ser Gly Ser Gly Lys Ser Thr Leu Ala
      50             55             60

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Cys Ala Leu Ser Arg Glu Leu His Gly Arg Gly His Leu Thr Tyr Val
      65             70             75             80

```

Leu Asp Gly Asp Asn Leu Arg His Gly Leu Asn Arg Asp Leu Ser Phe
 85 90 95
 Gly Ala Glu Asp Arg Ala Glu Asn Ile Arg Arg Val Gly Glu Val Ala
 100 105 110
 Lys Leu Phe Ala Asp Ala Gly Leu Val Cys Ile Ala Ser Leu Ile Ser
 115 120 125
 Pro Tyr Arg Ser Asp Arg Ser Ala Cys Arg Asp Leu Leu Pro Lys His
 130 135 140
 Ser Phe Ile Glu Val Phe Leu Asp Val Pro Leu Gln Val Cys Glu Ala
 145 150 155 160
 Arg Asp Pro Lys Gly Leu Tyr Lys Leu Ala Arg Ala Gly Lys Ile Lys
 165 170 175
 Gly Phe Thr Gly Ile Asp Asp Pro Tyr Glu Pro Pro Ser Asp Cys Glu
 180 185 190
 Ile Val Ile Gln Cys Lys Val Gly Asp Cys Pro Ser Pro Glu Ser Met
 195 200 205
 Ala Gly His Val Val Ser Tyr Leu Glu Thr Asn Gly Phe Leu Gln Asp
 210 215 220

<210> 3
 <211> 1217
 <212> DNA
 <213> Zea mays

<400> 3
 gcgtccgttt catttcatca atcaaacaga acctctgggtc acacacacgc agcaaccacc 60
 gagcccagcg cccggcccag ccagccaggg ccaacggcaa ggcaacaccc tcctcagccc 120
 gacgccgacg ctgcgcgtca tctcgtataa tccacagcgc gcgcctcccg tcctcccagg 180
 cctcacccct agcgatgcgc cactcccggc gctcgtgatc catggcctca ctcccogttc 240
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 agcagcgccc ggggaggccc cgcacagccc agtgaaggag aagcctgtaa tgtcgaacat 420
 tgggaaatcg actaatattt tatggcacia ttgcttgatt ggacaatctg atagacagaa 480
 attgctggga caaaaaggct gtgtcgtatg gataacagga ctcaagtgggt cagggaaaag 540
 tactcttgca tgtgcactga gtcgtgagtt gcattgcaga ggccacctca cgtatgtact 600
 tgatggtgac aacctcagac atggcctaaa tagagattta agctttaagg cagaagaccg 660
 tgcagaaaaat atacgaagag ttggtgaagt ggcaaagctt tttgctgatg ctggtgtcat 720
 atgcattgct agcttgatat ctccatacag gagagatcgt gatgcatgcc gtgctctact 780
 tccacattct aactttattg aagtatttat tgatttgccc ctaaaaattt gtgaagctcg 840
 tgatcctaaa ggcctataca agcttgacgc tacagaaaag attaaagggt tcaactggaat 900
 tgatgatcca tacgaaccac caattaatgg tgagatagta attaatga aagatgagga 960
 atgcccttca ccaaagcaa tggccaagca agttctatgc taccttgaag aaaacggata 1020
 ttgcaagct tagtatatgt attttgagaa gattgatctg attcttgtgt gtccattact 1080
 tgtggacaca ataagatctg ttgttggtca catgaataaa aggcataaac atgtaggaag 1140
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 <211> 343
 <212> PRT
 <213> Zea mays

<400> 4

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Arg Pro Phe His Phe Ile Asn Gln Thr Glu Pro Leu Val Thr His Thr
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Gln Gln Pro Pro Ser Pro Ala Pro Gly Pro Ala Ser Gln Gly Gln Arg
          20           25           30

Gln Gly Asn Thr Leu Leu Ser Pro Thr Pro Thr Leu Ala Val Ile Leu
          35           40           45

Val Asn Pro Gln Arg Ala Pro Pro Val Leu Pro Gly Leu Thr Pro Ser
          50           55           60

Asp Ala Pro Leu Pro Ala Leu Val Ile His Gly Leu Thr Pro Arg Ser
          65           70           75           80

Ser His Ser Ser Ala Gly Leu Ala Ser Asp Ser Gly Arg Arg Glu Gly
          85           90           95

Glu Gly Arg Gly Ala Arg Thr His Cys His Arg Gly Ile Gly Arg Trp
          100          105          110

Val Arg Arg Arg Arg Arg Asn Gly Ala Ala Pro Gly Glu Ala Pro His
          115          120          125

Ser Pro Val Lys Glu Lys Pro Val Met Ser Asn Ile Gly Lys Ser Thr
          130          135          140

Asn Ile Leu Trp His Asn Cys Leu Ile Gly Gln Ser Asp Arg Gln Lys
          145          150          155          160

Leu Leu Gly Gln Lys Gly Cys Val Val Trp Ile Thr Gly Leu Ser Gly
          165          170          175

Ser Gly Lys Ser Thr Leu Ala Cys Ala Leu Ser Arg Glu Leu His Cys
          180          185          190

Arg Gly His Leu Thr Tyr Val Leu Asp Gly Asp Asn Leu Arg His Gly
          195          200          205

Leu Asn Arg Asp Leu Ser Phe Lys Ala Glu Asp Arg Ala Glu Asn Ile
          210          215          220

Arg Arg Val Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Val Ile
          225          230          235          240

Cys Ile Ala Ser Leu Ile Ser Pro Tyr Arg Arg Asp Arg Asp Ala Cys
          245          250          255

Arg Ala Leu Leu Pro His Ser Asn Phe Ile Glu Val Phe Ile Asp Leu
          260          265          270

Pro Leu Lys Ile Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu
          275          280          285

Ala Arg Thr Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr
          290          295          300

```

Glu Pro Pro Ile Asn Gly Glu Ile Val Ile Lys Met Lys Asp Glu Glu
305 310 315 320

Cys Pro Ser Pro Lys Ala Met Ala Lys Gln Val Leu Cys Tyr Leu Glu
325 330 335

Glu Asn Gly Tyr Leu Gln Ala
340

<210> 5
<211> 431
<212> DNA
<213> Oryza sativa

<220>
<221> unsure
<222> (48)

<220>
<221> unsure
<222> (346)

<220>
<221> unsure
<222> (431)

<400> 5
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gtgccgaagg cgtccaatat cttctggcat gattgtgcag ttggccaggc tgatcggcag 120
aagctactga agcagaaaagg ttgcgttggt ttgatcacag gacttagtgg ttcagggtaaa 180
agtaccctgg catgcacatt agatcgagag ctccatacaa gagggaagct ttcttatggt 240
cttgatggtg ataattttaag acatgggttg aacaaggatc ttggctttaa ggcggaagac 300
cgtgctgaaa atatacgcaa agttggtgag gtagcaaagc tattcncaga tgcaagccta 360
gtatgcattg caagtttcaa atctccctat aagagagaac gtgagtcctg gccctgcaat 420
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<210> 6
<211> 118
<212> PRT
<213> Oryza sativa

<220>
<221> UNSURE
<222> (98)

<400> 6
Ser Ile Val Pro Lys Ala Ser Asn Ile Phe Trp His Asp Cys Ala Val
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Gly Gln Ala Asp Arg Gln Lys Leu Leu Lys Gln Lys Gly Cys Val Val
20 25 30

Trp Ile Thr Gly Leu Ser Gly Ser Gly Lys Ser Thr Leu Ala Cys Thr
35 40 45

Leu Asp Arg Glu Leu His Thr Arg Gly Lys Leu Ser Tyr Val Leu Asp
50 55 60

Gly Asp Asn Leu Arg His Gly Leu Asn Lys Asp Leu Gly Phe Lys Ala
65 70 75 80

Phe Ser Gly Lys Asn Leu Thr Gln Met Ser Asn Val Gly Asn Ser Thr
100 105 110

Asn Ile Met Trp His Asp Cys Pro Ile Gln Lys Gln Asp Arg Gln Gln
 115 120 125
 Leu Leu Gln Gln Gln Gly Cys Val Ile Trp Leu Thr Gly Leu Ser Gly
 130 135 140
 Ser Gly Lys Ser Thr Ile Ala Cys Ala Leu Ser Gln Ser Leu His Ser
 145 150 155 160
 Lys Gly Lys Leu Ser Tyr Ile Leu Asp Gly Asp Asn Ile Arg His Gly
 165 170 175
 Leu Asn Gln Asp Leu Ser Phe Arg Ala Glu Asp Arg Ser Glu Asn Ile
 180 185 190
 Arg Arg Ile Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Val Ile
 195 200 205
 Cys Ile Thr Ser Leu Ile Ser Pro Tyr Gln Lys Asp Arg Asp Ala Cys
 210 215 220
 Arg Ala Leu Leu Ser Lys Gly Asp Phe Ile Glu Val Phe Ile Asp Val
 225 230 235 240
 Pro Leu His Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu
 245 250 255
 Ala Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr
 260 265 270
 Glu Pro Pro Cys Ser Cys Glu Ile Val Leu Gln Gln Lys Gly Ser Asp
 275 280 285
 Cys Lys Ser Pro Ser Asp Met Ala Glu Glu Val Ile Ser Tyr Leu Glu
 290 295 300
 Glu Asn Gly Tyr Leu Arg Ala
 305 310

<210> 9
 <211> 928
 <212> DNA
 <213> Triticum aestivum

<400> 9
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 tggctgccgg gaagcagccc gtcaatggat cagccatggc aggtatcgac aagcttgtga 120
 cctcaactgt tgggaaatcg acaaacgttc tttggcatga ctgtccaata ggtcagtttg 180
 agaggcagga actgctaaat cagaagggtt gtgttggtg gataacaggg ttaagtgggt 240
 cagggaaaag cacactagca tgcgcgctaa gtcgcgagct gcaactccaga ggtcatctga 300
 cctacattct agacggtgac aatctaaggc atgggttaaa ccgagacctc tgtttcgaag 360
 caaaggaccg tgctgaaaat atacgcagag taggagaagt agcaaagctg tttgcagatg 420
 ctggtctgat ctgcattgct agcttgatat caccctacag aagtgaacgc agcgcttgcc 480
 gcaaattact gcacaattct acattcatcg aggtgtttt gaatgtccca cttgaagttt 540
 gtgaagctag ggatccaaaa ggcttgtaca agcttgcccg tgcaggaaaa atcaaagggt 600
 ttactggaat tgatgatcct tatgaagcac cttctgactg cgagatagtg atacagtgca 660
 aagctggtga ctgcgccacg cctaaatcga tggctgatca agttgtgtca tatctgaag 720
 caaatgagtt cttacaggaa tagagacgta tgctatggat gaaaaaacat tctgaaattg 780
 gatcgccaag ggatgtgaaa tatgaggtag tatttatgtc tagaaagagt gatgatagta 840
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ttttgacgca aaaaaaaaaa aaaaaaaaaa

928

<210> 10

<211> 246

<212> PRT

<213> Triticum aestivum

<400> 10

Thr Arg Ala Asp Ala Gly Glu Arg Met Ala Gly Ser Glu Ala Val Pro
1 5 10 15

Val Val Ala Val Ala Ala Gly Lys Gln Pro Val Asn Gly Ser Ala Met
20 25 30

Ala Gly Ile Asp Lys Leu Val Thr Ser Thr Val Gly Lys Ser Thr Asn
35 40 45

Val Leu Trp His Asp Cys Pro Ile Gly Gln Phe Glu Arg Gln Glu Leu
50 55 60

Leu Asn Gln Lys Gly Cys Val Val Trp Ile Thr Gly Leu Ser Gly Ser
65 70 75 80

Gly Lys Ser Thr Leu Ala Cys Ala Leu Ser Arg Glu Leu His Ser Arg
85 90 95

Gly His Leu Thr Tyr Ile Leu Asp Gly Asp Asn Leu Arg His Gly Leu
100 105 110

Asn Arg Asp Leu Cys Phe Glu Ala Lys Asp Arg Ala Glu Asn Ile Arg
115 120 125

Arg Val Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Leu Ile Cys
130 135 140

Ile Ala Ser Leu Ile Ser Pro Tyr Arg Ser Glu Arg Ser Ala Cys Arg
145 150 155 160

Lys Leu Leu His Asn Ser Thr Phe Ile Glu Val Phe Leu Asn Val Pro
165 170 175

Leu Glu Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu Ala
180 185 190

Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr Glu
195 200 205

Ala Pro Ser Asp Cys Glu Ile Val Ile Gln Cys Lys Ala Gly Asp Cys
210 215 220

Ala Thr Pro Lys Ser Met Ala Asp Gln Val Val Ser Tyr Leu Glu Ala
225 230 235 240

Asn Glu Phe Leu Gln Glu
245

<210> 11

<211> 521

<212> DNA

<213> Triticum aestivum

<400> 11
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aggcaatggc ccagcaagtt ctgtcctacc ttgagaagaa cggatatttg caggcttagc 180
atatatatac tccagatcca gaagattgaa cttattcttc tgtgtccata actcatggac 240
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cctctcgcgc gtgttgtgct attttagctg tagtctatac ttgctcattt cggctgaaat 420
ggtgtgctgt gctgtgctgt gtttatttgt tggtaatgta tgatttgatt gtgggtgtca 480
aaagtacgaa tgaataaatc gtgcttgctt tttcaaaaaa a 521

<210> 12
<211> 58
<212> PRT
<213> Triticum aestivum

<400> 12
Thr Arg Leu Ala Arg Thr Gly Lys Ile Lys Gly Phe Thr Gly Val Asp
1 5 10 15
Asp Pro Tyr Glu Ser Pro Val Asn Ser Glu Ile Val Ile Lys Met Glu
20 25 30
Gly Gly Glu Cys Pro Ser Pro Lys Ala Met Ala Gln Val Leu Ser
35 40 45
Tyr Leu Glu Lys Asn Gly Tyr Leu Gln Ala
50 55

<210> 13
<211> 312
<212> PRT
<213> Catharanthus roseus

<400> 13
Met Ile Gly Ser Val Lys Arg Pro Val Val Ser Cys Val Leu Pro Glu
1 5 10 15
Phe Asp Phe Thr Glu Ser Thr Gly Leu Gly Lys Lys Ser Ser Ser Val
20 25 30
Lys Leu Pro Val Asn Phe Gly Ala Phe Gly Ser Gly Gly Gly Glu Val
35 40 45
Lys Leu Gly Phe Leu Ala Pro Ile Lys Ala Thr Glu Gly Ser Lys Thr
50 55 60
Ser Ser Phe Gln Val Asn Gly Lys Val Asp Asn Phe Arg His Leu Gln
65 70 75 80
Pro Ser Asp Cys Asn Ser Asn Ser Asp Ser Ser Leu Asn Asn Cys Asn
85 90 95
Gly Phe Pro Gly Lys Lys Ile Leu Gln Thr Thr Thr Val Gly Asn Ser
100 105 110
Thr Asn Ile Leu Trp His Lys Cys Ala Val Glu Lys Ser Glu Arg Gln
115 120 125

Glu Pro Leu Gln Gln Arg Gly Cys Val Ile Trp Ile Thr Gly Leu Ser
 130 135 140
 Gly Ser Gly Lys Ser Thr Leu Ala Cys Ala Leu Ser Arg Gly Leu His
 145 150 155 160
 Ala Lys Gly Lys Leu Thr Tyr Ile Leu Asp Gly Asp Asn Val Arg His
 165 170 175
 Gly Leu Asn Ser Asp Leu Ser Phe Lys Ala Glu Asp Arg Ala Glu Asn
 180 185 190
 Ile Arg Arg Ile Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Val
 195 200 205
 Ile Cys Ile Ala Ser Leu Ile Ser Pro Tyr Arg Lys Pro Pro Asp Ala
 210 215 220
 Cys Arg Ser Leu Leu Pro Glu Gly Asp Phe Ile Glu Val Phe Met Asp
 225 230 235 240
 Val Pro Leu Lys Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys
 245 250 255
 Leu Ala Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro
 260 265 270
 Tyr Glu Pro Pro Leu Lys Ser Glu Ile Val Leu His Gln Lys Leu Gly
 275 280 285
 Met Cys Asp Ser Pro Cys Asp Leu Ala Asp Ile Val Ile Ser Tyr Leu
 290 295 300
 Glu Glu Asn Gly Tyr Leu Lys Ala
 305 310
 <210> 14
 <211> 276
 <212> PRT
 <213> Arabidopsis thaliana
 <400> 14
 Met Ile Ala Ala Gly Ala Lys Ser Leu Leu Gly Leu Ser Met Ala Ser
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 20 25 30
 Val Val Val Arg Ala Cys Val Ser Met Asp Gly Ser Gln Thr Leu Ser
 35 40 45
 His Asn Lys Asn Gly Ser Ile Pro Glu Val Lys Ser Ile Asn Gly His
 50 55 60
 Thr Gly Gln Lys Gln Gly Pro Leu Ser Thr Val Gly Asn Ser Thr Asn
 65 70 75 80
 Ile Lys Trp His Glu Cys Ser Val Glu Lys Val Asp Arg Gln Arg Leu
 85 90 95

Leu Asp Gln Lys Gly Cys Val Ile Trp Val Thr Gly Leu Ser Gly Ser
 100 105 110
 Gly Lys Ser Thr Leu Ala Cys Ala Leu Asn Gln Met Leu Tyr Gln Lys
 115 120 125
 Gly Lys Leu Cys Tyr Ile Leu Asp Gly Asp Asn Val Arg His Gly Leu
 130 135 140
 Asn Arg Asp Leu Ser Phe Lys Ala Glu Asp Arg Ala Glu Asn Ile Arg
 145 150 155 160
 Arg Val Gly Glu Val Ala Lys Leu Phe Ala Asp Ala Gly Ile Ile Cys
 165 170 175
 Ile Ala Ser Leu Ile Ser Pro Tyr Arg Thr Asp Arg Asp Ala Cys Arg
 180 185 190
 Ser Leu Leu Pro Glu Gly Asp Phe Val Glu Val Phe Met Asp Val Pro
 195 200 205
 Leu Ser Val Cys Glu Ala Arg Asp Pro Lys Gly Leu Tyr Lys Leu Ala
 210 215 220
 Arg Ala Gly Lys Ile Lys Gly Phe Thr Gly Ile Asp Asp Pro Tyr Glu
 225 230 235 240
 Pro Pro Leu Asn Cys Glu Ile Ser Leu Gly Arg Glu Gly Gly Thr Ser
 245 250 255
 Pro Ile Glu Met Ala Glu Lys Val Val Gly Tyr Leu Asp Asn Lys Gly
 260 265 270
 Tyr Leu Gln Ala
 275